MODIS Direct Broadcast Data Processing System Overview and Development Status

MODIS Science Team Meeting

5/5/99

Presented by

Daesoo Han

Code 935, Goddard Space Flight Center

- The scope of this presentation is limited to Level 1A and 1B MODIS Direct Broadcast data processing system

- Questions on Antenna system, data capture, and Level 0 processing system should be directed to:
  - Patrick.Coronado@gsfc.nasa.gov

MODIS Direct Broadcast Ground Data System

- Background
- System Overview
- Review of Accomplishments
- Future Work
- Contact Point

Background

- MODIS data will be broadcast by Terra and PM platforms
- MODIS DB data user base is just forming and inquiring on access to MODIS DB processing system
- MODIS Science Team and NASA HQ wanted to provide MODIS data products to a wide audience
- MODIS project scientist needed a central place to provide MODIS DB data processing system and algorithm/calibration updates to users
- It was decided to form a group to provide MODIS DB users with “Official” MODIS Level 1 and selected Level 2 product processing system for MODIS DB data
- A team, MODIS DB Ground Team (MDBGT) was formed
- NASA/HQ provided limited funding
- MODIS Science Data Support Team and MODIS Characterization Support Team agreed to provide support to MDBGT

System Overview

- MODIS Direct Broadcast (DB) Specifications
- MODIS DB Ground Team (MDBGT)
- Potential MODIS DB User Sites
- MDBGT Interfaces
- MODIS DB Ground Data Processing Elements

MODIS Direct Broadcast Specifications

- Direct Broadcast Data will be available from EOS AM and PM platforms
- Specifications
  - » Operation: 100 % except over DSN stations when they are in use
  - » Range: 2574.5 km at ground elevation angle of 5 degrees (about 10 - 12 minute contact time for overhead pass)
  - » Frequency: 8212.5 MHz
  - » Data Rate: 13.125 Mbps (about 1 GB per overhead pass)
  - » Data: MODIS instrument Day and Night mode and spacecraft Ancillary data

MDBGT

- MODIS Direct Broadcast Ground Team (MDBGT)
  - » Centralized place to provide to MODIS DB users with:
    - – Source code of Level 1 and selected Level 2 processing system
    - – Updated calibration tables
    - – New/modified algorithm information and processing software
    - – Technical support on DB processing system
  - » Team Members
    - – Daesoo Han (Code 935)
    - – Larry Shotland (RDC)

Potential MODIS DB User Sites

- Currently identified users are:
  - GSFC
  - EPA
  - EDC
  - NOAA
  - DEA
  - US Forest Service
  - U. of Hawaii, U. of Wisconsin, U. of Kansas, U. of Miami
  - Tokai U.
  - Chinese Met. Agency,
  - Dundee U.
  - RACs
  - RESAC
  - Commercial sectors (.....)

MDBGT Interfaces

- MDBGT will interface with
  - » Level 0 producers (EDOS, RAC, U. of Wisconsin, U. of Hawaii, etc.)
  - » MODIS Science Data Support Team
  - » MODIS Characterization Support Team
  - » MODIS Scientist Team
  - » DB data Users

MODIS DB Level 1 Processing System

Software

- Use DAAC production software
- Running on Unix based platforms
- Utilizes EOSDIS Toolkit
- Meets EOSDIS data standards
- Source code for Level 1 and selected Level 2 processing systems will be made available to users

Ancillary Data

- MODIS Calibration tables will be available through MDBGT
- Other ancillary data must be obtained from appropriate source institutions and we will point users to sources

MODIS DB Ground Data Processing Elements

- Preprocessing
  - » Demodulation
  - » Viterbi Decoding
  - » Reed-Solomon Decoding
  - » Frame Sync.
- Level 0 Processing
  - » Packet Sorting
  - » Packet Ordering
  - » QC Annotation

Others

- Level 1 Processing
  - » Scan Reconstruction
  - » Earth Location
  - » Radiometric Calibration
- Level 2 Processing
  - » Parameter retrieval

MDBGT

Review of Accomplishments

- MODIS DB Data Processing System
- Overview of MODIS DB Level 1 Processing System
- Level 1 Software
- Toolkit
- Level 0 Data
- Level 1 Processing Timing Analysis
- Summary

MODIS DB Data Processing System

- Baseline System
  - » MODIS Emergency Backup System with Version 2 Level 1A and Version 2.1 Level 1B software were imported
  - » Analyzed the MEBS software and collected all necessary routines
  - » Ran the baseline system with an ephemeris data file to compute earth locations (Release 1.0)
  - » Ran the system with ancillary data to compute earth locations
- MODIS DB Data Processing System
  - » Modified the baseline system to meet DB data processing needs
  - » Will repeat the above steps when next Version of Level 1A and 1B are available

Accomplishments

Level 1 Baseline System Software

- Received Version 2 ECS Level 1A source code from GSC/SAIC working for SDST (5/98).
  - » Contains two main modules (about 100,000 lines of code)
  - » MOD_PR01 (Reformatting Level 0 into Level 1A)
  - » MOD_PR03 (Earth location)
  - » Completed trace routine analysis on a HP work station (TRMM Office) - all module relations are listed (32 page document was produced)

- Received Version 2.1 ECS Level 1B source code from GSC/SAIC (5/98)
  - » About 3 MB code (about 60,000 lines of code)
  - » Contains MOD_PR02 module (Calibration)
  - » Completed trace routine analysis

Toolkit

- Level 1 baseline system software requires the following routines and we have acquired all of them
  - » SDPTK - About 30 MB (obtained from ECS)
  - » MAPI - About 56 MB (obtained from GSC/SAIC)
  - » HDF - About 315 MB (obtained from ECS)
  - » HDF-EOS About 6 MB (obtained from ECS)
  - » IMSL Cost about $20,000 per copy.
    - – Wrote necessary routines to replace IMSL

- SDPTK calls a lookup table of 3 GB 1 km DEM

Level 0 Data

- Assumption: Level 0 data received should conforms EDOS data specifications.
  - » We received Level 0 data from EDOS

Level 1 Processing Timing Analysis

- SGI Origin 200 (1 processor)
- 200 scans (about 5 min data: 500 MB)
  - » About 2 GB disk space required to store temporary data

- MOD_PR01 (Reformatting) ~ 3 min 22 sec
- MOD_PR03 (Earth location) ~ 17 min 56 sec
- MOD_PR02 (Calibration) ~ 19 Min 8 sec

Release 2 System

- Waiting new release from SDST and MCST

Summary

- Level 0 test data is available for testing Baseline Level 1 software
- Release 1 processing system has been tested and ready to be released to users

Future Work

- Develop DB Release 2.0 system
  - » Modify granule size from 5 minute to scan based processing
  - » Bypass construction record that is the first record in Level 0 data. A construction record contains annotation of data quality.
  - » Work with MCST to develop calibration procedures for local areas which receive data only over the ground receiving stations.
- Identify Level 2 products to be included in the system and incorporate them into the system.
- Modify new releases of MODIS production software for MODIS DB data processing
- DB processing system will be ready 4 months after official MODIS prelaunch software released to MDBGT

Contact Information

MDBGT Leader: Daesoo Han
Code 935
Greenbelt, MD 20771
NASA/GSFC
(301) 286-9414
han@trmm.gsfc.nasa.gov